BIOGRAPHICAL SKETCH

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NAME: Allen Timothy Newton

eRA COMMONS USER NAME (credential, e.g., agency login): N/A

POSITION TITLE: Sr. Research Imaging Specialist, Vanderbilt University Institute of Imaging Science

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Vanderbilt University, Nashville, TN	B.E.	2003	Biomedical Engineering
Vanderbilt University, Nashville, TN	M.S.	2005	Biomedical Engineering
Vanderbilt University, Nashville, TN	Ph.D.	2009	Biomedical Engineering

Please refer to the Biographical Sketch sample in order to complete sections A, B, C, and D of the Biographical Sketch.
NOTE: The Biographical Sketch may not exceed five pages. Follow the formats and instructions below.

A. Personal Statement

As an expert in translational pediatric imaging and functional neuroimaging, I have focused on both development of new imaging techniques as well as transitioning existing techniques into clinical practice. Currently, I serve a dual role supporting of pediatric clinical imaging at the Monroe Carell Jr. Children's Hospital at Vanderbilt as well as maintaining my own research activities at the Vanderbilt University Institute of Imaging Science. Much of my work involves taking advantage of high field (3T,7T) in translational capacities. I have designed, executed, and published studies including typical functional imaging of humans while they perform simple tasks as well as resting state imaging of humans for measurement of functional connectivity. I have led studies of perfusion in clinical populations, and am currently working on methods for perfusion image analysis for use in the clinic. I also have significant experience developing imaging protocols on the human NMR imaging systems (Philips 1.5T, 3.0T, and 7.0T) as well as with those systems used in the designed for imaging small animals (Varian vertical 4.7T and horizontal 9.4T).

Relevant Publications:

1. A Multispecialty Pediatric Neurovascular Conference: A Model for Interdisciplinary Management of Complex Disease. Ladner, Travis R. et al.Pediatric Neurology , Volume 52 , Issue 2 , 165 – 173

2. Evaluation of a multiple spin-and gradient-echo (SAGE) EPI acquisition with SENSE acceleration: Applications for perfusion imaging in and outside the brain. JT Skinner, RK Robison, CP Elder, AT Newton, BM Damon, CC Quarles. Magnetic resonance imaging 32 (10), 1171-1180

3. Assessing functional connectivity in the human brain by fMRI. BP Rogers, VL Morgan, AT Newton, JC Gore. Magnetic resonance imaging 25 (10), 1347-1357

4. Modulation of steady state functional connectivity in the default mode and working memory networks by cognitive load. AT Newton, VL Morgan, BP Rogers, JC Gore. Human brain mapping 32 (10), 1649-1659

B. Positions and Honors

2000 May-Aug	Research Assistant, Vanderbilt University Department of Physics, Nashville, TN
2001 May-Aug	Research Assistant, Vanderbilt University Department of Electrical Engineering, Nashville, TN
2003-2004	Teaching Assistant, Vanderbilt University Department of Biomedical Engineering, Nashville, TN
2004-2009	Research Assistant, Vanderbilt University Department of Biomedical Engineering, Nashville, TN
2009-2011	Postdoctoral Fellow, Vanderbilt University Department of Radiology and Radiological Science, Nashville, TN
2011-	Sr. Imaging Research Specialist, Vanderbilt University Institute of Imaging Science, Nashville, TN

C. Contribution to Science

Contribution 1: Understanding Measurements of Functional Connectivity. While functional magnetic resonance imaging has been as well established technique for over twenty years, its sibling technique of resting state functional connectivity remains less well understood. Thus it was important to study factors that affect measurement of resting state functional connectivity. I have helped outline the fact that functional connectivity measurements are affected by the cognitive conditions under which they are made. I have shown this to be the case across cognitive networks, specifically demonstrating it in motor working memory, and default mode networks. Furthermore, I have contributed to the field's work in understanding the relationship between functional and structural connectivity measurements. In all of these findings, I have spearheaded the development of the questions to be answered, the study design and execution, and the reporting of findings.

1. Task demand modulation of steady-state functional connectivity to primary motor cortex. AT Newton, VL Morgan, JC Gore. Human brain mapping 28 (7), 663-672

2. Assessing functional connectivity in the human brain by fMRI. BP Rogers, VL Morgan, AT Newton, JC Gore. Magnetic resonance imaging 25 (10), 1347-1357

3. Modulation of steady state functional connectivity in the default mode and working memory networks by cognitive load. AT Newton, VL Morgan, BP Rogers, JC Gore. Human brain mapping 32 (10), 1649-1659

4. Integrating functional and diffusion magnetic resonance imaging for analysis of structure-function relationship in the human language network. VL Morgan, A Mishra, AT Newton, JC Gore, Z Ding. PLoS One 4 (8), e6660

***Contribution 2: Advancing Functional MRI Beyond Basic Image Acquisition Techniques*.** For over 20 years fMRI acquisitions have remained relatively unchanged with a reliance on echo planar imaging and slice selective techniques. However, advances in MR hardware have opened the possibility of improving these techniques, potentially facilitating new and more informative measurements. My work has focused on developing techniques that increase the amount of information gathered in functional imaging experiments and/or improve the quality of functional imaging measurements. We found that functional measurements of perfusion can be improved by simultaneously acquiring multiple contrast types (gradient and spin echo) while taking advantage of modern acceleration techniques. Other work found that using ultra high magnetic fields (7T), spatial resolution of images can be increased and that despite the corresponding decrease in signal to noise, contrast-to-noise can actually be improved via decreases in partial volume averaging. This has implications for many forthcoming functional imaging studies that attempt to make use of higher resolution images, as they may be more able to increase resolution than would typically be assumed. My role in these studies has ranged from the lead of study design, execution, and interpretation. Some studies required that I focus more heavily on imaging technique development.

1. Evaluation of a multiple spin-and gradient-echo (SAGE) EPI acquisition with SENSE acceleration: Applications for perfusion imaging in and outside the brain. JT Skinner, RK Robison, CP Elder, AT Newton, BM Damon, CC Quarles. Magnetic resonance imaging 32 (10), 1171-1180

2. Improving measurement of functional connectivity through decreasing partial volume effects at 7T. AT Newton, BP Rogers, JC Gore, VL Morgan. Neuroimage 59 (3), 2511-2517

3. Fine-scale functional connectivity in somatosensory cortex revealed by high-resolution fMRI. L Chen, A Mishra, AT Newton, VL Morgan, EA Stringer, BP Rogers, ... Magnetic resonance imaging 29 (10), 1330-1337

Contribution 3: Advancing Functional Connectivity Analysis Techniques. Functional connectivity analyses have been widely employed but are generally poorly understood. In fact, it is commonly assumed that statistical inferences appropriate for task-driven fMRI studies are equally appropriate for resting state data. However my work has now begun to study whether this is in fact the case. With my collogues, I have begun to evaluate statistical underpinnings of resting state fMRI data. This is evident in the stistical inference work listed below. Furthermore, new types of connectivity analysis may be important for the future development of this field. A good example of this is the work on connectivity tensors listed below. That work has two interesting facets. First, it demonstrates the idea that connectivity may be meaningfully measured on the local scale (instead of only looking at long distance correlations), and that such connectivity may have directional information. Furthermore, that work demonstrated that there may indeed be low amplitude resting state fluctuations in white matter that are of a neuronal origin, as indicated by their connectivity tensors. This lays the groundwork for future studies of resting state neuronal activity in white matter using fMRI, something that has so far been thought to be impossible. My role in these projects spanned experiment design, design of image acquisitions, execution of image acquisitions.

1. Evaluation of Statistical Inference on Empirical Resting State fMRI. X Yang, H Kang, AT Newton, BA Landman. Biomedical Engineering, IEEE Transactions on 61 (4), 1091-1099

2. Quantitative evaluation of statistical inference in resting state functional MRI. X Yang, H Kang, A Newton, BA Landman. Medical Image Computing and Computer-Assisted Intervention–MICCAI 2012, 246-253

3. Spatio-temporal correlation tensors reveal functional structure in human brain. Z Ding, AT Newton, R Xu, AW Anderson, VL Morgan, JC Gore. PloS one 8 (12), e82107

Contribution 4: Understanding Anatomic and Functional Organization of The Brain Using Novel techniques. As new imaging techniques are developed, it is important to apply them to new and interesting problems that have previously been difficult to solve. Here, we have identified several applications where important knowledge can be gained only through the employment of advanced imaging techniques. In the first, we used high-resolution 7T anatomic imaging to create shape models of the thalamus that can then be used to better segment the thalamus in patients with clinically standard 3T imaging for use in image guidance of deep-brain stimulator placement. This is a good example of taking advantage of cutting edge imaging techniques and translating to clinically relevant settings and addressing similarly clinically relevant problems. Here, I was in charge of the design of image acquisitions, and their execution. We also used our work in high-resolution functional imaging to show nuances of somatosensory representation in the brain, with implications for pain perception. We likewise took advantage of improved functional imaging to characterize socially important regions of cortex, such as the fusiform face area (FFA). Finally, we took advantage of a spectrum of imaging techniques to better understand why functional imaging of deep brain structures, critical to the function of the rest of the brain, remains difficult to accomplish. This paves the way for new technique development that can overcome these challenges. In each of these studies, I was responsible in whole or in part for image acquisition and interpretation.

1. Thalamic nuclei segmentation in clinical 3T T1-weighted Images using high-resolution 7T shape models. Y Liu, PF D'Haese, AT Newton, BM Dawant. SPIE Medical Imaging, 94150E-94150E-9

2. Distinct fine-scale fMRI activation patterns of contra-and ipsilateral somatosensory areas 3b and 1 in humans. E Ann Stringer, PG Qiao, RM Friedman, L Holroyd, AT Newton, JC Gore, ... Human brain mapping 35 (9), 4841-4857

3. Robust expertise effects in right FFA. RW McGugin, AT Newton, JC Gore, I Gauthier. Neuropsychologia 63, 135-144

4. On the origins of signal variance in FMRI of the human midbrain at high field. RL Barry, M Coaster, BP. Rogers, AT Newton, J Moore, AW Anderson, ... PloS one 8 (4), e62708

Complete List of Publications:
Google Scholar
https://scholar.google.com/citations?user=26lnQgMAAAAJ

NCBI
http://www.ncbi.nlm.nih.gov/sites/myncbi/1t7joXIk-ngQe/bibliograpahy/48063918/public/?sort=date&direction=ascending

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D. Research Support

Completed Research Support

2T32 EB001628-06 Gore (PI) 05/01/08-04/30/13
NIH/NIBIB
Postdoctoral Training in Biomedical MRI and MRS
This application seeks support for a comprehensive postdoctoral training program in magnetic resonance imaging (MRI) and spectroscopy (MRS) at Vanderbilt University.
Role: Trainee

5R01 EB000461-08 Gore (PI) 09/01/06-05/01/09
NIH/NIBIB
Integrated Imaging of Brain Function at 7 Tesla
This is a research partnership designed to develop and integrate different methods of brain imaging using MRI, NIR, ERP and advanced methods of data analysis.
Role: Research Assistant

5T32 EB03817-05 Gore (PI) 08/01/04-08/31/06
NIH/NIBIB
Predoctoral Training Program in Biomedical Imaging
This application seeks support for a comprehensive pre-doctoral training program in imaging science at Vanderbilt University.
Role: Trainee